

CLAIMS:

1. An optical element for an optical scanning device for reading and/or writing an optical record carrier of any one of at least first, second and third formats, at least said first format comprising a multi-layer carrier format, said optical element comprising at least two objective lenses, a first of said objective lenses being arranged and configured to provide substantially optimal compensation for spherical aberration during reading and/or writing of both said second format and a first layer of said multi-layer carrier format, and a second of said objective lenses being arranged and configured to provide substantially optimal compensation for spherical aberration during reading and/or writing of both said third format and a second layer of said multi-layer carrier format.
5. 10. An optical element according to claim 1, wherein the objective lenses comprise separate elements.
15. 3. An optical element according to claim 1, wherein the objective lenses are provided in a monolithic, multi-lens component.
4. 20. An optical element according to claim 3, wherein said monolithic component is manufactured by means of a plastic injection moulding technique.
5. 25. An optical element according to any one of the preceding claims, wherein each objective lens is provided with a diffractive and a refractive element.
6. An optical element according to claim 5, wherein each objective lens is provided with a diffraction grating.
7. An optical element according to claim 6, wherein said diffraction grating is a blazed grating, wherein the height of each blaze is selected such that for the various formats high efficiency is achieved at a single diffraction order.

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8. An optical element according to claim 7, wherein the blaze height for each respective format is determined by $h = \lambda / (n - 1)$, where h is the blaze height, n is the refractive index of the medium (of which the objective lens is formed).

5 9. A method of manufacturing an optical element according to any one of claims 1 to 8.

10. A method according to claim 9, comprising a plastic injection moulding process.

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11. An optical scanning device for reading and/or writing to an optical record carrier of any one of at least three formats, the device comprising a source of electromagnetic radiation and including an optical element according to any one of claims 1 to 8, whereby one of said objective lenses is used to focus a beam of electromagnetic radiation on a data record layer in accordance with the format of the optical record carrier being read and/or written, and an actuator for moving said optical element relative to said optical record carrier so as to maintain said electromagnetic beam focussed on said data record layer.

15 12. An optical scanning device according to any one of claims 1 to 11, wherein said multi layer format comprises Blu-ray Disc or Portable Blue.

13. An optical scanning device according to claim 12, wherein said second and third formats may comprise CD and DVD respectively.